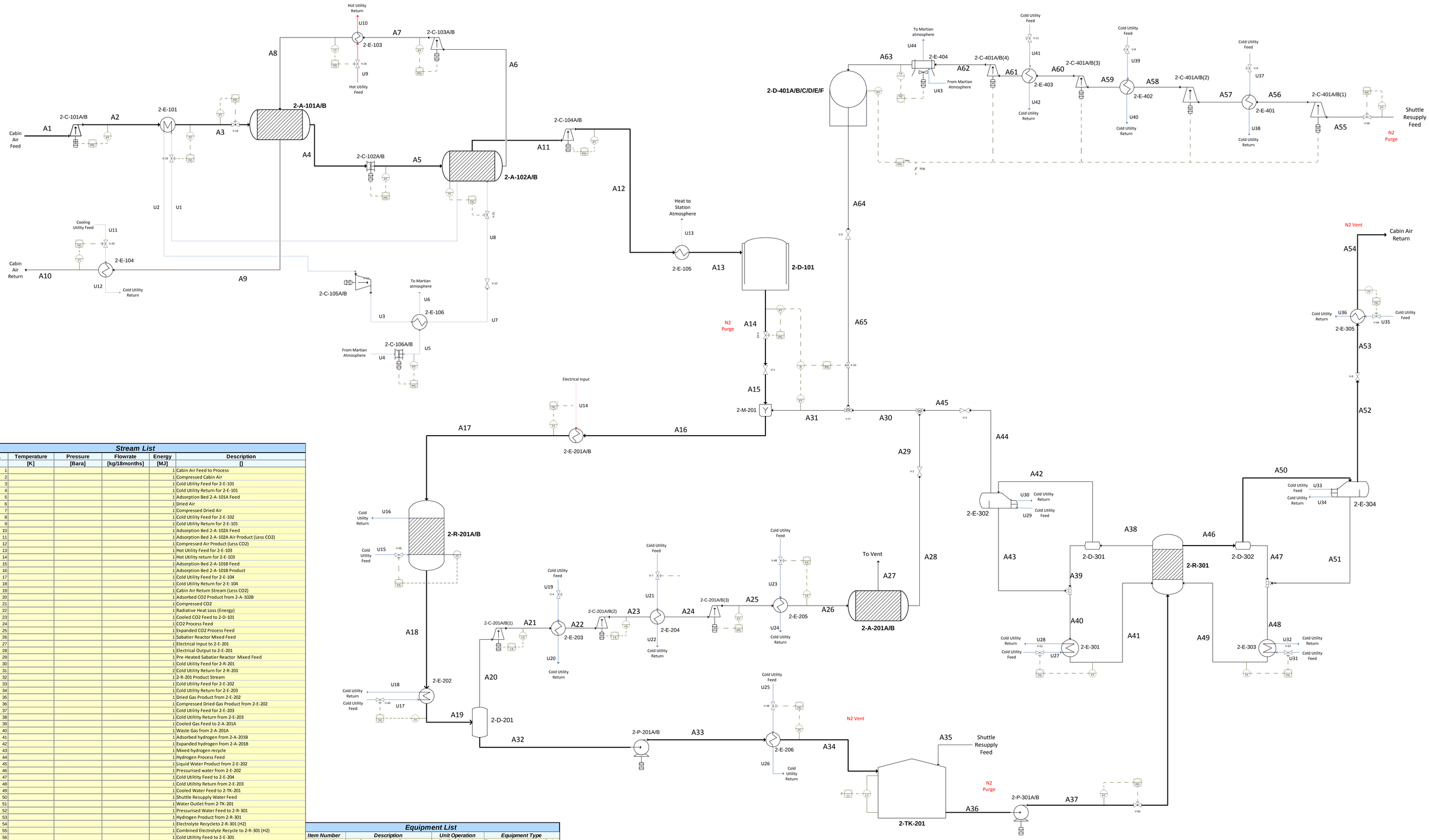

Stream List

Stream No.	Temperature	Pressure	Flowrate	Energy	Description
[]	[K]	[Bara]	[kg/18months]	[MJ]	[]
1				1	Cabin Air Feed to Process
2				1	Compressed Cabin Air
3				1	Cold Utility Feed for 2-E-101
4				1	Cold Utility Return for 2-E-101
5				1	Adsorption Bed 2-A-101A Feed
6				1	Dried Air
7				1	Compressed Dried Air
8				1	Cold Utility Feed for 2-E-102
9				1	Cold Utility Return for 2-E-101
10				1	Adsorption Bed 2-A-102A Feed
11				1	Adsorption Bed 2-A-102A Air Product (Less CO2)
12				1	Compressed Air Product (Less CO2)
13				1	Hot Utility Feed for 2-E-103
14				1	Hot Utility return for 2-E-103
15				1	Adsorption Bed 2-A-101B Feed
16				1	Adsorption Bed 2-A-101B Product
17				1	Cold Utility Feed for 2-E-104
18				1	Cold Utility Return for 2-E-104
19				1	Cabin Air Return Stream (Less CO2)
20				1	Adsorbed CO2 Product from 2-A-102B
21				1	Compressed CO2
22				1	Radiative Heat Loss (Energy)
23				1	Cooled CO2 Feed to 2-D-101
24				1	CO2 Process Feed
25				1	Expanded CO2 Process Feed
26				1	Sabatier Reactor Mixed Feed
27				1	Electrical Input to 2-E-201
28				1	Electrical Output to 2-E-201
29				1	Pre-Heated Sabatier Reactor Mixed Feed
30				1	Cold Utility Feed for 2-R-201
31				2	Cold Utility Return for 2-R-201
32				1	2-R-201 Product Stream
33				1	Cold Utility Feed for 2-E-202
34				1	Cold Utility Return for 2-E-203
35				1	Dried Gas Product from 2-E-202
36				1	Compressed Dried Gas Product from 2-E-202
37				1	Cold Utility Feed for 2-E-203
38				1	Cold Utility Return from 2-E-203
39				1	Cooled Gas Feed to 2-A-201A
40				1	Waste Gas from 2-A-201A
41				1	Adsorbed hydrogen from 2-A-201B
42				1	Expanded hydrogen from 2-A-201B
43				1	Mixed hydrogen recycle
44				1	Hydrogen Process Feed
45				1	Liquid Water Product from 2-E-202
46				1	Pressurised water from 2-E-202
47				1	Cold Utility Feed to 2-E-204
48				1	Cold Utility Return from 2-E-203
49				1	Cooled Water Feed to 2-TK-201
50				1	Shuttle Resupply Water Feed
51				1	Water Outlet from 2-TK-201
52				1	Pressurised Water Feed to 2-R-301
53				1	Hydrogen Product from 2-R-301
54				1	Electrolyte Recycleto 2-R-301 (H2)
55				1	Combined Electrolyte Recycle to 2-R-301 (H2)
56				1	Cold Utility Feed to 2-E-301
57				1	Cold Utility Return from 2-E-301
58				1	Cooled Combined Electrolyte Recycle to 2-R-301 (H2)
59				1	Wet Hydrogen Product Gas
60				1	Cold Utility Feed to 2-E-302
61				1	Cold Utility Return from 2-E-302
62				1	Liquid Product from 2-E-302
63				1	Dried Hydrogen Product from 2-E-302
64				1	Expanded Hydrogen Recycle
65				1	Wet Oxygen Product Gas
66				1	Electrolyte Recycleto 2-R-301 (O2)
67				1	Combined Electrolyte Recycle to 2-R-301 (O2)
68				1	Cold Utility Feed to 2-E-303
69				1	Cold Utility Return from 2-E-303
70				1	Cooled Combined Electrolyte Recycle to 2-R-301 (O2)
71				1	Wet Oxygen Product Gas
72				1	Cold Utility Feed to 2-E-304
73				1	Cold Utility Return from 2-E-304
74				1	Liquid Product from 2-E-304
75				1	Dried Oxygen Product from 2-E-304
76				1	Expanded Oxygen Product
77				1	Cold Utility Feed to 2-E-305
78				1	Cold Utility Return from 2-E-305
79				1	Oxygen Product Cabin Return
80				1	Hydrogen Resupply Feed from Shuttle
81				1	Compressed Hydrogen Resupply
82				1	Martian Air Feed to 2-E-401
83				1	Martian Air Return from 2-E-401
84				1	Cooled Hydrogen Resupply to 2-D-401
85				1	Hydrogen Make-up Stream from 2-D-401

Equipment List

Item Number	Description	Unit Operation	Equipment Type
2-A-101A/B	Water Removal Adsorption Bed	Gas/Gas Separation	Temperature Swing Adsorption Bed
2-A-102A/B	CO2 Removal Adsorption Bed	Gas/Gas Separation	Temperature Swing Adsorption Bed
2-A-201A/B	H2 Removal Adsorption Bed	Gas/Gas Separation	Pressure-Swing Adsorption Bed
2-C-101A/B	Cabin Air Compressor	Fluid Transfer	
2-C-102A/B	Dried Air Blower	Fluid Transfer	
2-C-103A/B	Vacuum Compressor For Air Evacuation	Fluid Transfer	
2-C-104A/B	Vacuum Compressr for CO2 Recovery	Fluid Transfer	
2-C-201A/B	Compressor For Hydrogen Recovery	Fluid Transfer	
2-C-401A/B	Hydrogen Storage Compressor	Fluid Transfer	Multi-Stage Reciprocating
2-D-101	CO2 Atmospheric Gas Storage	Gas Storage	Gas Storage Balloon
2-D-301	Hydrogen Knock-Out Drum	Gas/Liquid Separation	
2-D-302	Oxygen Knock-Out Drum	Gas/Liquid Separation	
2-D-401A/B/C	Bulk Hydrogen Storage Vessel	Gas Storage	Spherical Pressure Vessel
2-E-101	Air Feed Pre-Cooler	Heat Exchange	Shell and Tube
2-E-102	Dried Air Feed Cooler	Heat Exchange	
2-E-103	Air Heater	Heat Exchange	Shell and Tube
2-E-104	Cabin Air Return Cooler	Heat Exchange	Shell and Tube
2-E-105	CO2 Gas Cooler	Heat Exchange	Single Pipe Radiation
2-E-201A/B	Sabatier Reactor Feed Heater	Heat Exchange	Internal Electrical Coil
2-E-202	Sabatier Reactor Product Condenser	Heat Exchange	
2-E-203	H2 Adsorption Bed Pre-Cooler	Heat Exchange	
2-E-204	Water Storage Feed Cooler	Heat Exchange	Double Pipe Exchanger
2-E-301	Electrolyte Recycle Cooler (H2)	Heat Exchange	
2-E-302	H2 Product Dryer	Heat Exchange	
2-E-303	Electrolyte Recycle Cooler (O2)	Heat Exchange	
2-E-304	O2 Product Dryer	Heat Exchange	
2-E-305	Oxygen Product Cooler	Heat Exchange	
2-E-401	Hydrogen Resupply Cooler	Heat Exchange	Air Cooler
2-M-201	Reactor Feed Mixer	Fluid Mixing	Agitated Vessel
2-P-201A/B	Water Storage Feed Pump	Fluid Transfer	
2-P-301A/B	Electrolysis Reactor Feed Pump	Fluid Transfer	
2-R-201A/B	Sabatier Reactor	Chemical Reaction	Packed Bed Reactor
2-R-301	Electrolysis Reactor	Electrochemical Reaction	
2-TK-201	Electrolysis Feed Water Storage Tank	Liquid Storage	Fixed Roof Tank

Valve List

Displayed Text	Description	Line Size	Valve Class	Manufacturer	Model
V-1					
V-10					
V-17					
V-18					
V-19					
V-2					
V-22					
V-24					
V-25					
V-3					
V-34					
V-43					
V-45					
V-46					
V-47					
V-48					
V-49					
V-5					
V-50					
V-51					
V-53					
V-54					
V-56					
V-6					

Process Flow Diagram Line Colour Key

- Process Control Scheme :–
- Main Process Line :–
- Auxiliary Process Line :–
- Cold Utility Line :–
- Hot Utility Line :–

Process Flow Diagram Line Style Key

- Main Process Fluid Line :–
- Auxiliary Process Fluid Line :–
- Control Electrical Signal :– — — —
- Energy Stream :– — · · — · ·

PROCESS FLOW DIAGRAM

Air Treatment Plant

University of Edinburgh | Edinburgh

COMPANY LOGO

DRAWING NO. 1 | REV.

REV.	DATE	DESCRIPTION	DR. BY	ORIG. ENG.	APPROVED